DOCUMENT RESUME

ED 419 503 IR 018 914

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TITLE Northeast Louisiana University Teacher Enhancement Program.
PUB DATE 1998-00-00
NOTE 11p.; In: NECC '98: Proceedings of the National Educating Computing Conference (19th, San Diego, CA, June 22-24, 1998); see IR 018 902.
PUB TYPE Reports - Descriptive (141) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Educational Change; Educational Resources; Educational Technology; Elementary Secondary Education; Higher Education; *Internet; Program Effectiveness; Program Implementation; *Teacher Education
IDENTIFIERS *Northeast Louisiana University; Technology Integration

ABSTRACT

It is the goal of the Northeast Louisiana University (NLU) Teacher Enhancement Program to prepare teachers to use the Internet with sufficient skill to effectively integrate resources of the Internet with state-mandated curriculum guides, translate the technology into daily activities in mathematics and science courses, and train their colleagues. To evaluate the effectiveness of this program, 27 participants divided into 3 groups (categorized by the level of their participation in the program) were given a survey that included both objective and open-ended questions. Participants were asked what major changes have been made in the way that they conducted classes before using computer activities; this document is a summary of their responses. Overall, participation in the program was viewed as beneficial to the teachers' schools. (AEF)

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ED 419 503

Paper Session

Northeast Louisiana University Teacher Enhancement Program

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Key Words: Internet, technology, trainer, computer, math, science

Abstract

Technology is now being addressed nationally as an integral part of both the Standards of Science and the Standards of Mathematics. With this drive has developed an urgent need to train our educators not only to integrate technology into to the curriculum but also how to use technology itself. The desire has been the driving force behind, what has become known as, the Northeast Louisiana University (NLU) Teacher Enhancement Program. It is the goal of this program to prepare teachers to use the Internet with sufficient skill to effectively integrate resources of the Internet with state mandated curriculum guides, translate the technology into daily activities in mathematics and science courses, and train their colleagues. Is this program successful in achieving this goal? To evaluate this, the participants were given a survey that included both objective and open-ended questions. The following document is a summary of their responses. Because Group III has just begun the program, they provided limited responses to the open-ended questions. Group II has yet to put the program to practice, but many have examined how they will incorporate technology into their curricula during the new academic

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year. As a whole, an overwhelmingly positive attitude toward the program was expressed by most of the respondents.

Once training has been received, it is only natural that previous classroom climate will be changed. But in what ways? Participants were asked what major changes have been made in the way that they conducted classes before using computer activities? The primary response from Group I was the use of the Internet as a teaching tool and incorporating technology into their group projects and team work. Likewise Group II, which has received only training and is returning to the classroom this year for practice, has made plans to use the Internet to expose the students to facets of learning to which they otherwise would not have access. For example, one teacher plans to have students visit a site addressing fractals. Until this time, she has only been able to offer students black and white pictures. Another teacher anticipates her new role as "an information guide, rather than an information provider." Taking this view, students will be able to construct their own knowledge and, as another Group II participant noted, students will experience "more discovery learning."

Introduction

The following statement appeared in a 1992 survey report, "Education and the New Information Technologies—Teacher Training," released by the Centre for Educational Research and Innovation of the Organization for Economic Cooperation and Development (OECD):

> *The potential of the new information and communication technologies for improving learning and teaching will not be realized unless teachers are well trained and retrained in their pedagogical use. Familiarization with the technologies is not sufficient; the real challenge is the training of teachers in the use of interactive technologies for nontrivial applications, such as simulations and model building, problem solving, complex microworlds, or exploration and discovery, and even judicious uses of basic software packages, such as word processing, spreadsheets, and databases.*

The essence of the Teacher Enhancement Program at Northeast Louisiana University (NLU) was a plan to address one of the problems implied in the above statement; namely, the training and retraining of classroom teachers (trainers) who would train and retrain their colleagues and students to use the Internet to expand and enrich their educational experiences. Our project was made feasible because the State of Louisiana established a statewide network, LANET, in December 1992. By December 1993, provisions were made for all public and private colleges and universities in Louisiana to be connected to LANET and, consequently, to the Internet. The state instituted a master plan calling for all K–12 schools to gain access to LANET starting in 1994. The missing link was a comprehensive training program for educators that would stimulate the application of Internet resources in the classroom and the continued growth of teachers.

Northeast Louisiana University and 15 local school districts joined in addressing this

need through this project, which was funded by the National Science Foundation Teacher Enhancement Program in 1995. When it is completed in 1998, this three-year project will have provided these school districts with a cadre of well-trained resource persons and the support necessary to benefit from electronic networking. This project will, in the space of three years, have prepared 60 teachers to use the Internet with sufficient skill to effectively integrate resources on the Internet with state-mandated curriculum guides, translate the technology into daily activities in mathematics and science courses, and train their colleagues. Personal networking and electronic communication channels will have been established so that these teachers will have access to sources of expert assistance in their teaching endeavors at all times.

The teachers chosen to participate in the project had to have demonstrated the ability and desire to enhance the way that science and mathematics were taught in their schools. These distinguished teachers had to assume graduate assistant positions for two semesters and one summer at NLU while on sabbatical leave from their respective schools. Coursework taken during their assistantships included not only specific Internet training and incorporation of Internet mathematics and science applications into the classroom but also education in methodology and leadership training. The goal of the project was that the teachers not only learn how to navigate the network but that they also have the skills necessary to return to their school districts as resource persons capable of training others to use the Internet.

Why Do the Survey?

Because we were midway through the project we wanted to evaluate the results at that point. The survey looked mainly at what impact, if any, technology was having on the participant and his or her students as a direct result of being a part of the NLU Teacher Enhancement Program. Open-ended questions were designed to investigate changes, if any, in teaching methodology and to what extent these changes were impacted by the implementation of state and national standards for mathematics, science, and technology. Also targeted were changes in teaching style as a direct result of using computer activities and how these changes have affected classroom procedures. The results of the survey are also being used to help determine the direction that the NLU Teacher Enhancement Program should take before resubmitting for a future program of this type. The survey collected information about the participants, such as teaching background, demographic information about school and school district, and professional enrichment and training activities. We feel that these issues have a direct impact on the participants and cannot be ignored when viewing the results from this survey.

Who Responded to the Survey?

A total of 27 participants responded to the survey. The chart below categorizes the groups from which the survey responses came.

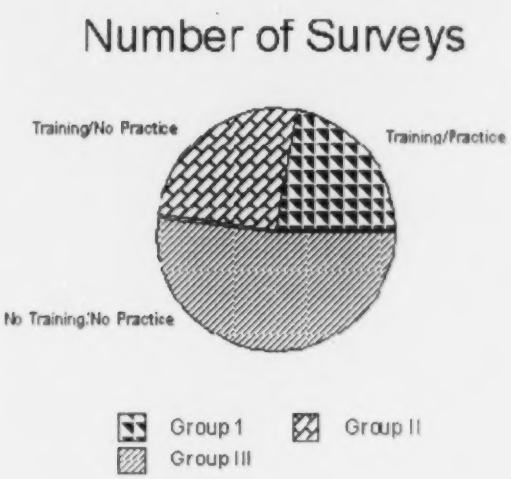

Figure 1

Replies from the survey reflect a sample from each group, with more than half of the responses from Group III because they were in class when the survey was taken. Although the numbers were small for Group I and II, they reflect 33.3% and 36.8% returns, respectively; Group III had a 66.7% return of surveys from participants. Participants from all three groups represent a sample from each grade level that is demonstrated in Figure 2.

The three groups were categorized by the level of their participation in the program. Group I, 1995–96, as having (training/ practice), Group II, 1996–97, as having (training/no practice) and Group III, 1997–98, as having (no training/no practice). Group I had finished an intense program during the 1995–96 school year taking graduate-level courses that included a practicum. This practicum was conducted in their parish as a computer technology liaison and trainer.

The first section of the survey asked the teachers questions about their teaching experience. Information on how many years of teaching experience, grade level of experience, and subject matter that each had taught is summarized in Figure 2 and Chart 1.

In analyzing Question 1, Group II and Group I teachers reflected averages of 18.7 and 20 years of classroom experience respectively. These numbers alone would lead one to think that both groups had equally experienced teachers. However, the minimum and maximum numbers for Group I were 14 years to 24 years, while Group II had 9 years to 24 years. Group III displayed the least teaching experience with an average of 13 years of teaching experience with a minimum of 7 years and a maximum of 18 years. This observation was interesting because it was the seasoned teacher who became involved with a program that emphasized technology rather than the teacher with less classroom experience.

Responses to Question 2 are summarized in Figure 2, which shows the grade level

for teaching experience of the participants. The results show that the background of Group I participants represented school types of K–12, elementary, and middle schools; Group II represented a sample from each of the school types; while Group III dominated elementary, middle school, and high school levels. This indicates that on completion of the three-year program, there will be a base of experience and expertise available for each grade level of K–12 on the use of the Internet for the participating districts.

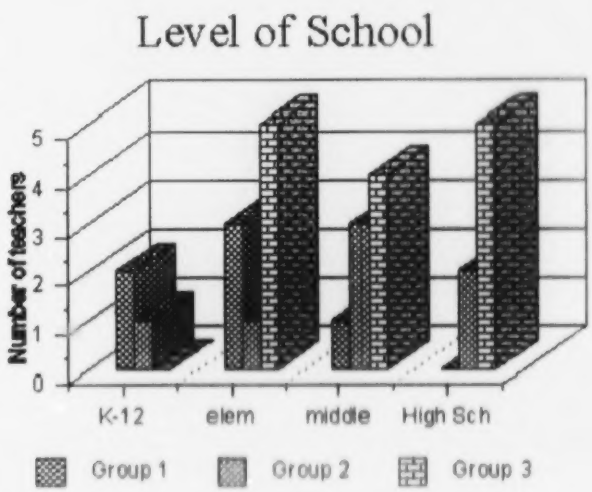

Figure 2

Subjects Taught

Chart 1. Subjects that have been taught by the participants.

4% (1)	Astronomy	18.5% (5)	Technology
4% (1)	Biology	48% (13)	Elementary School Science
4% (1)	Chemistry	44% (12)	Elementary School Math
18.5% (5)	Computer Science	33% (9)	General Mathematics
25.9% (7)	Earth Science	14.8% (4)	Algebra
14.8% (4)	Environmental Science	14.8% (4)	Geometry
22% (6)	Life Science	7% (2)	Pre-calculus
22% (6)	Physical Science	7% (2)	Calculus
18.5% (5)	Social Science	4% (1)	Probability/Statistics

The results show that elementary math and science along with general mathematics brought the highest numbers of the participants. There were very few participants that taught high-level courses, i.e., calculus, statistics, and chemistry. Group III's survey replies were double the number of Group I or Group II, which reflected the fact that they were currently enrolled at NLU.

Question 4 shows that this program should have significant impact at the elementary level with slightly less than half of the responses indicating that they have been teaching elementary mathematics and science.

The results from questions 4 and 5 reflect that the participants represented every grade level of school and a wide area of subject matter that is being affected by the participation of the teacher. As stated in the introduction, the thrust of this project was to train K–12 teachers in the use of the Internet with emphasis on integrating its resources in teaching mathematics and science.

State and national standards for mathematics, science, and technology stress that instructional materials and equipment can increase students' interest and improve achievement. Students should have access to materials and equipment and be offered opportunities to learn to use them effectively. It is essential that classroom teachers have the necessary nonconsumable and consumable material and equipment and that they have means to maintain and/or replenish these as needed. With this in mind the survey directed questions 5–19 to investigate the school and school district profile of each participant.

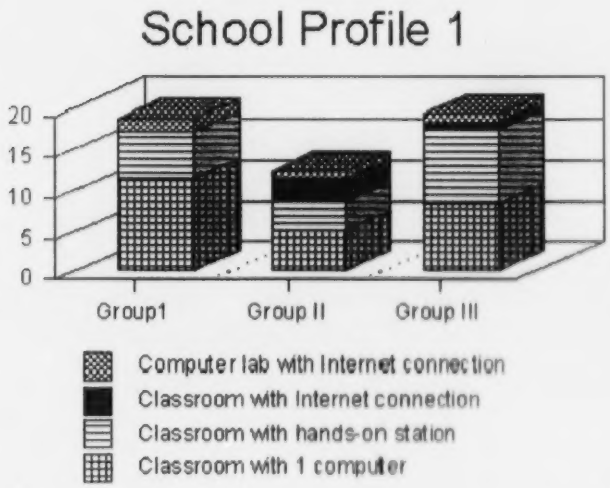

Figure 3

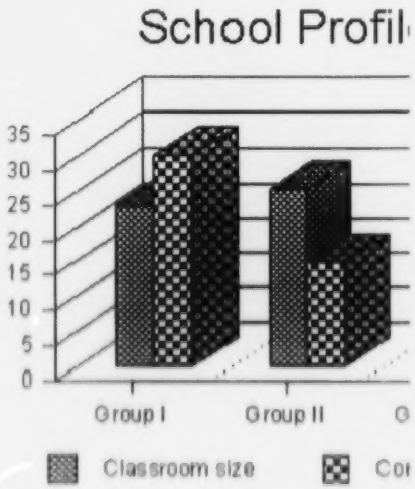

Figure 4

Figures 3 and 4 demonstrate that there is a critical need for more classrooms that are equipped with computers and Internet connections. For reform to occur in

mathematics, science, and technology, it is imperative that hands-on teaching is included in the curriculum. It is recommended by the National Council of Teachers of Mathematics and Science that classrooms should keep current with the state-of-the-art technology appropriate for the grade level being taught.

The results of our survey show that schools and school districts have projected an increase in their spending for technology for the 1997–98 school year. We are sure that this is a direct impact of the new technology plan that was implemented this year at the state level. Millions of dollars were earmarked to enhance technology at the K–12 grade level by the state legislators.

In personal interviews with several of the participants of this program, many have played key roles in authoring and researching information for their parish technology plans that were submitted this past July to compete for these funds. Several participants from Group I and Group II have also taken on new jobs as technology coordinators for their districts.

Professional enrichment and training are illustrated in charts 2 and 3. The thrust of the program was to prepare the participants to return to their schools and districts as trainers. This program provided opportunity and encouragement for the participants to attend state and national meetings in their disciplines and to become involved with the technology plans in their own districts. It opened the door of opportunity to many as they have returned to their districts as the technology coordinator and Internet trainer. For some these skills have taken them beyond the schools and into the community through training for local businesses, organizations, and churches.

Professional Enrichment

Chart 2. Workshops that participants attended.

44% (12)	attended hands-on workshops for technology training
44% (12)	attended hands-on workshops for Internet training
26% (7)	attended hands-on workshops for incorporating technology with the curriculum

Professional Training

Chart 3. Workshops that participants conducted.

3.7% (1)	have instructed hands-on workshops on technology training
48% (13)	have instructed hands-on workshops for Internet training
7.7	have instructed hands-on workshops for incorporating technology with the curriculum

State and national standards require the integration of technology into the curriculum. To what extent have state and national standards for mathematics,

science, and technology affected the participants' teaching of the curriculum? Having been exposed to these standards, many of the Group I teachers stated that changes have been made in the classroom to reflect those standards. Following the lead of the national standards, new benchmarks have been mandated by the state. At least one of the local parishes has also developed a technology plan and is presenting it to the state for approval. Another teacher commented, "My curriculum was affected drastically in that I teach math only. The standards are very well planned, and it is easy to find Internet access to sites that are in conjunction [with the standards]." Group II teachers anticipated that they will be using more discovery techniques with more observation-type [as opposed to test] evaluation. Instruction will be geared more to application orientation rather than rote memorization.

Changes have been made in the teaching styles of most participants as a result of using computer activities. Many of the Group I teachers had been using computer-assisted instruction before joining this program; they therefore have expanded this usage even more. Technology allows students the opportunity to model activities for other classmates. One teacher noted that she is now more flexible. She has rewritten existing lesson plans to incorporate the computer, and this has improved classroom instruction. She has also learned to be more patient, step back, and let the students use the technology. Likewise in Group II, these educators planned to assume the role of the facilitator, thus allowing their students to have more responsibility in their learning. One educator noted that she feels that she is now able to accommodate more learning styles.

Different expectations of students have developed as a result of using the computer for class activities. Teachers in Group I have found that their expectations for their students are greater. They required students to use the computer to complete in-class assignments because, with the incorporation of technology in the classroom, students now have access to material and information that without the technology they would not have available to them. Those from Group II planned to use Rubric for grading. The concentration will not be so much on the correctness of the answers but on how the students arrived at the results. As one respondent noted, this will allow for more individualized instruction.

Another result of these changes is the use of different materials and examples. The computer and, more importantly, the Internet are being used more in the classrooms of the program's participants. To make this successful, teachers of both Group I and Group II are finding resources for lesson plans on the Internet. Many different materials are being used to reach every learning style. Hands-on equipment is used to complete activities that were, in the recent past, normally completed with paper and pencil. Group II members predict that they will be experimenting with more types of software and attempting to make computer activities a normal part of the day rather than a separate entity.

Are teachers evaluating their students differently as a result of using this new technology? The answer is yes. Alternative methods of assessment are being discovered by Group I and Group II. One respondent of Group I noted that no one test is a good tool to measure a student's ability. In Group II, Rubric will be used by several of the teachers. A Group II educator pointed out that computers bring out the best in some students, and consequently she expects a positive difference to be reflected in their performance. On the other hand, one teacher in Group II noted that

she will be using computer tests and computer graded tests (bubble tests). While this is not an innovative use of the technology, it is a practical one.

What part of teaching with computers is viewed by the teachers as the most difficult? A great deal of planning and organizing has to be done to use computers in the classroom. This was the consensus of both groups. Accommodating students who do not have many computer skills and are not secure in the new environment was a major concern of one of the Group I members. In other words, each student must be brought to a common point of understanding. Most are either very knowledgeable or have no experience at all. Another issue of difficulty that the participants have addressed is the shortage of computers for effective instruction and the money needed to upgrade and connect to the Internet. Members of Group II foresaw many of the same difficulties. They also noted the need to plan for failed access to the Internet. In other words, what back-up activities might be needed, or what can be done while waiting for the downloading of links during heavy use times.

The teachers were asked: What do you most enjoy about teaching using computer activities? "Everything! It is magic in the classroom. The kids love it!" responded a Group I educator. Others noted that it is motivating for the students and, as a result, the instructor. It offers versatility and piques students' interests. Group II foresaw that having up-to-the-minute information available would be an asset.

Participation in the program was viewed as beneficial to the participants' professional development. The teachers of both groups have acquired expertise in this area, and these participants are now able to train others, and they themselves have grown professionally; thus they have received "beneficial exposure." Additionally, through this program some Group I and Group II teachers have been able to attend NECC and LACUE conferences and work toward master's degrees and plus 30, in addition to attaining certification in computer science. Another Group I teacher noted that this program has delivered a new excitement about teaching. It was explained by a Group I participant that these teachers have been provided with an opportunity and the time to explore a medium that, at the beginning of the program, they knew nothing about. Group II members noted that at this point they have become more aware of changes in technology and how to integrate it into instruction. They were excited that, through the workshops they have taught, they were able to transfer their new found knowledge and excitement to other teachers in their parishes.

The participants were asked: Overall how was your participation in the program beneficial to your students? "Whenever a teacher is excited about something new, the children know it, and when that knowledge is shared, they grow! My students have blossomed! They enjoy the computer, the Internet, and they enjoy being successful! If children do not learn the way we teach them, we must change and teach them the way they learn. Computers enable us to do that, and so does this program!" replied a Group I teacher. Furthermore, students are learning skills that will help them get a job, responded another Group I participant. A Group II member observed that when students are "playing" on the computer more retention has been observed and interest has increased.

Participation in the program is viewed as beneficial to the teachers' schools. A

Group I educator noted: "I gained training expertise. I am able to go out and train others, and I am able to use the knowledge I have gained to grow professionally, and also secure grants for the school." Teachers are now trained and can provide staff development training in basic computer terminology and the Internet. A Group I teacher's home school was even selected as a pilot school for their Parish technology project in the spring of 1997. Many of the participants have been able to have their schools connected to the Internet. Group II participants have also had similar experiences. Teachers have aided their schools in writing technology plans. One participant is expecting improved standardized testing results, as well as decreased discipline problems.

When examining the programs benefits to the school districts, it was found that these educators have been able to extensively train other teachers in the school systems with Internet. Others felt it has helped move their schools forward. It was also noted that among teachers, a positive attitude is growing toward technology. One respondent stated "Hopefully my participation and the other teachers' participation will inspire funding and commitment to technology." Group II respondents also had very positive statements. One teacher announced, "I have had great support. My district is willing to try all forms of technology. We are striving to put a computer in every classroom. We did a tremendous amount of training all summer." These teachers will now be able to help the district meet its goal of producing productive citizens. Participants have helped to write the parish technology plans, which will aid in receiving technology funding from the state. Participating parishes will become more competitive in the "technology race" and will better prepare students for future career success.

Reviewing the responses of the participants of Group I, it is apparent that the program is achieving its goal. Attitudes toward the program are very positive, and the results are beneficial on not only the personal but the school and district levels as well. The visions that Group II expressed reveal their enthusiasm toward technology in the classroom. It is this enthusiasm that radiates and thus creates desires within others to pursue the benefits of technology. Based on the plethora of benefits cited by the participants of Groups I and II, it can be assumed that Group III will follow the same path.

With the incorporation of technology mandates into national standards of both math and science, it seems only logical that the other disciplines will soon follow. Assuming this, the far-reaching benefits of this program seem even more vast. Areas such as language arts and social sciences typically have not viewed technology as an integral part of their curriculum. However, major components of their curriculum, research, and writing, naturally lend themselves to current technology. The participants in this program have developed, as their responses have shown, an ability to attain an understanding of the technology, integrate technology into their curriculum, and train others in math and science to do the same. These trainers are the likely candidates to continue the training of teachers in these other disciplines.